

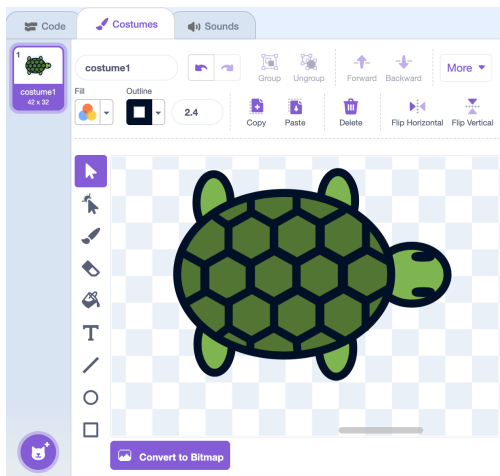
Name: \_\_\_\_\_ Date: \_\_\_\_\_

## L-system Turtle Graphics (part 1)

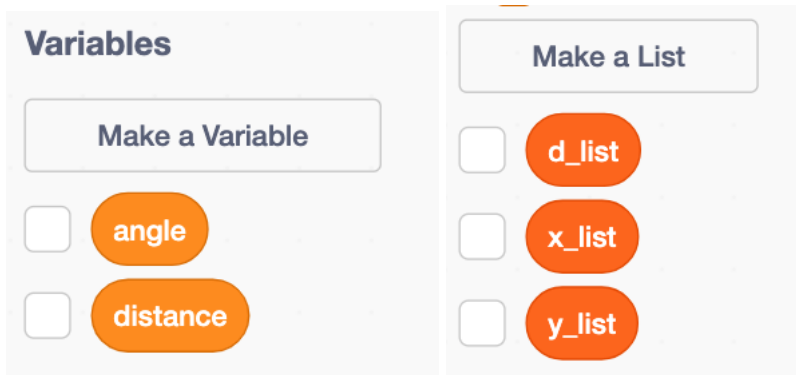
- In Scratch, we wish to create the following:
  1. A turtle sprite (from bird's-eye view)
  2. Use keyboard buttons to control the turtle using the following moves:
    - W = Move forward
    - D = Turn right
    - A = Turn left
    - S = Hop forward (and do not draw)
    - E = Save position at top of list
    - Q = Return to top-of-list position and delete position from list

## Start a new project

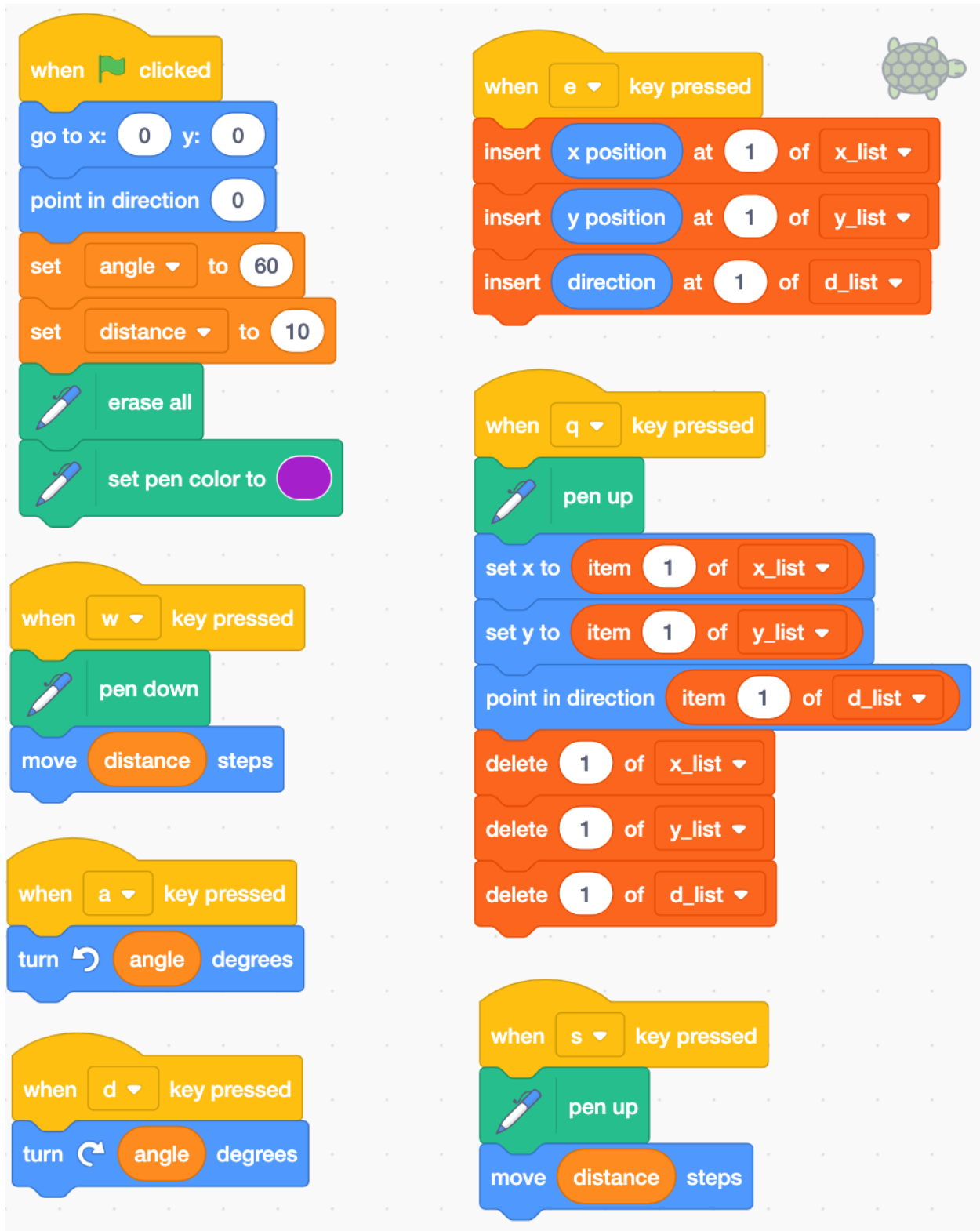
1. Go to <https://scratch.mit.edu>
  - Login to save your work.
  - Create a new project.
2. Click on **Costumes** to edit the cat.
  - Delete the 2nd costume.
  - Change the 1st costume to look like the following turtle:



3. Make the following variables and lists:



4. Write the code:



The code is organized into two columns of Scratch blocks. A small turtle icon is visible in the top right corner of the workspace.

**Left Column:**

- when clicked**
  - go to x: 0 y: 0
  - point in direction 0
  - set angle to 60
  - set distance to 10
  - erase all
  - set pen color to purple
- when w key pressed**
  - pen down
  - move distance steps
- when a key pressed**
  - turn angle degrees
- when d key pressed**
  - turn angle degrees

**Right Column:**

- when e key pressed**
  - insert x position at 1 of x\_list
  - insert y position at 1 of y\_list
  - insert direction at 1 of d\_list
- when q key pressed**
  - pen up
  - set x to item 1 of x\_list
  - set y to item 1 of y\_list
  - point in direction item 1 of d\_list
  - delete 1 of x\_list
  - delete 1 of y\_list
  - delete 1 of d\_list
- when s key pressed**
  - pen up
  - move distance steps

5. Make the turtle sized small (just big enough to see it is a turtle in fullscreen mode).

6. Make a drawing!

- Go to fullscreen mode.
- Click the green flag to Go.
- Type the following keys on your keyboard:

AWEA AWWW QEA W WQW EAAW WWA WDWD WDWD WDWQ EAWW  
WWAW DWDW DWDW DWQW EAAW WWQE AWWW QWDW EAAW WWQE  
AWWW QWEA AWWW WAWD WDWD WDWD WQEA WWW AWDW DWDW  
DWDW QWEA AWWW QEA W WQW DWEA AWWW QEA W WQW EAAW  
WWA WDWD WDWD WDWQ EAWW WWAW DWDW DWDW DWQW EAAW  
WWQE AWWW QWDW EAAW WWQE AWWW QWEA AWWW WAWD WDWD  
WDWD WQEA WWW AWDW DWDW DWDW QWEA AWWW QEA W WQW  
DWEA AWWW QEA W WQW EAAW WWA WDWD WDWD WDWQ EAWW  
WWAW DWDW DWDW DWQW EAAW WWQE AWWW QWDW EAAW WWQE  
AWWW QWEA AWWW WAWD WDWD WDWD WQEA WWW AWDW DWDW  
DWDW QWEA AWWW QEA W WQW ASSS SSSS SSSS

7. **Submit** a screenshot of the drawing **on Canvas**.

8. Make your own drawing!
  - Return to the code. Edit the distance, angle, and initial position.
  - Adjust the keys to whatever you want.
  - Add a key that changes the color.
  - Return to fullscreen.
  - Restart by hitting the green flag. (Go.)
  - Control the turtle to make a drawing.
9. **Submit** a screenshot of your drawing **on Canvas**.